DEVICE FOR FIXING INSTRUMENTS TO AN INSTRUMENT PANEL

The present invention relates to a device for fixing instruments to an instrument panel.

Found amongst the instruments fixed to an instrument panel of a vehicle, particularly an airplane, are an increasing number of liquid crystal display units which generally display synthetic images. The ergonomic performance of such display devices is assessed in particular through the ratio between the useful area of their screen and the area occupied by these devices on the instrument panel. This ratio is relatively low because of the bulk, at the instrument panel, of the device for mechanically fixing the display unit.

What happens is that this mechanical-fixing device is in the form of a flat web surrounding the liquid-crystal cell of the display unit at this cell and therefore appreciably increasing the bulk of the cell.

The subject of the present invention is a device for fixing instruments, particularly display units, to an instrument panel and which only very slightly increases the bulk, at the instrument panel, of the useful area of these instruments, which allows these instruments to be fitted quickly and reliably to instrument panels, and which improves the ability of these instruments to withstand vibrational environments and improve the dissipation of any heat that these instruments might produce.

The device for fixing to an instrument panel an instrument contained in a casing comprises, according to the invention, flanges formed on the instrument casing, behind its anterior face, preferably substantially at its center of gravity, and a recess formed in the instrument panel, the cross section of the recess being the same as that of the casing with

its flanges, the bottom of this recess being pierced with an opening having the same cross section as the casing alone, the depth of the recess being practically equal to the length of that part of the casing that lies between its anterior face and the flanges, means for immobilizing the casing being provided on the recess and on the casing. These means may advantageously be captive screws fixed to flanges and nuts or threaded holes in the bottom of the recess, the anterior face of the instrument having on its edges drillings for the passage of an instrument used to manipulate the captive screws.

The present invention will be better understood upon reading the detailed description of one embodiment, taken by way of non limiting example and illustrated by the appended drawing, in which:

- figures 1 and 2 are, respectively, a front view and a perspective view of an instrument of the prior art,
- figures 3 and 4 are, respectively, a front view and a perspective view of an instrument according to the invention,
- figure 5 is a front view showing, by fictitiously superimposing an instrument of the prior art and an instrument according to the invention, the reduction in the "dead space" achieved by the invention,
- figure 6 is a three-quarter rear perspective view of the instrument of figures 3 and 4, and
- figures 7 and 8 are side views of the instrument of figures 3, 4 and 6 when it is respectively partially and fully introduced into the corresponding recess formed in the instrument panel to which it is to be fixed.

The present invention is described hereinabove with reference to the fixing of an instrument, which is a

liquid crystal display screen, to the instrument panel of an airplane, but it must be understood that it is not restricted to this single application and that it can be implemented for fixing other types of instruments, and that the instrument panels may be those of other kinds of vehicles (helicopters, land and maritime vehicles, etc.) or those of highly diverse land installations (factory control stations, measurement apparatus, etc.).

The display 1 of the prior art as depicted in figures 1 and 2 comprises, at its anterior face, a liquid-crystal cell 2 forming the screen of the display. The display 1 is arranged in a casing 3 which is more or less in the shape of a right-angle parallelepiped, the anterior face of which it occupies. The electrical and electronic circuits of the display are arranged inside the casing 3. This anterior face is bordered along its four sides by a flat web 4 which allows it to be surface-mounted on the instrument panel (not depicted). In the example depicted, the web 4 is narrower along the vertical sides 4A/4B (it being assumed that the display 1 is arranged, as depicted in the drawing, on a horizontal flat support), of the cell than it is along its horizontal sides (parts 4C and 4D). These broader parts 4C and 4D allow the instrument 1 to be fixed to the instrument panel using screws passing through holes 5 made in these parts 4C, 4D. It may be noted that the useful area of the cell 2 is bordered by a relatively large "dead space" represented by the parts 4C and 4D of the web 4. The invention sets out to reduce this dead space without degrading the qualities of the fixing.

As depicted in figures 3 to 8, the casing 6 of the instrument 7 has been modified so that its fixing to the instrument panel is offset to the rear, it being possible for the surround 8 of its anterior face and, in particular, of its cell 2 to be reduced to the

minimum strictly necessary for holding the cell in the casing, possibly providing sealing between the two. The other elements of the instrument are identical to those of the casing of figures 1 and 2. The fixing according to the invention comprises two flanges 9, 10 formed on the lower face 6A and upper face 6B of the casing 6 parallel to the anterior face of the cell 2. These flanges 9, 10 are in the form of strips of rectangular cross section stretching across the entire width of the faces 6A, 6B respectively, at equal distances from the anterior face of the cell 2. This distance is such that the plane passing through the longitudinal axis of these strips passes as close as possible to the center of gravity G of the instrument 7 and, in particular, to the rear of the cell and of its illuminating device, in a region where the casing has a smaller cross section than it does in its anterior part. Thus, when the instrument is subjected to a vibrational environment, the vibrations it experiences are as small as possible. The flanges 9, 10 are pierced at their ends with plain holes 11, in which fixing screws 12 (captive screws) are immobilized. As an alternative, the central parts of the flanges 9, 10 could be omitted, leaving only their ends (fixing lugs), that is to say the strict minimum necessary for fixing the instrument 7 to the instrument panel. The cross section of these strips or lugs can be reduced to the minimum needed to give them solidity and to allow the holes 11 to be drilled in them.

The surround 8 of the cell 2 constitutes the anterior edge of the casing 6. It has a thickness (measured in the plane of the screen of the cell at right angles to the sides of the screen) of a few millimeters and a depth (measured at right angles to the plane of the screen) of 10 to 20 mm approximately, that is to say greater than that of the cell 2. Holes 13 for the passage of a tool (key or screwdriver) for tightening and loosening the screws 12 are drilled in the four

corners of the surround 8. Advantageously, regions 14 for grasping, for example in the form of shallow (for example 2 to 3 mm deep) oblong recesses, are advantageously made on two of the lateral faces of the surround 8, or on all of its lateral faces, these running over most of the lengths of these lateral faces at their anterior part.

As depicted in figures 7 and 8, in order to be able to fix the instrument 7 to the instrument panel 15, a recess 16 is formed in the latter. The depth P of this recess is practically equal to the distance D between the posterior edges 14A of the regions 14 for grasping and the posterior faces of the flanges 9, 10. The cross section of the recess 16 is equal to the "overall" cross section of the casing 6 with its flanges 9, 10. The bottom of the recess 16 is pierced with an opening the cross section of which is equal to that of the casing 6, behind its flanges. Thus, from the bottom of the recess 16 there remain two surfaces 17, 18 corresponding to the posterior faces of the flanges 9, 10 and on which the latter bear when the instrument 7 is pushed fully into the recess 16. In register with the screws 12, threaded holes are made into the wall thickness of the surfaces 17, 18, if this thickness is sufficient and if the instrument panel material so permits or, alternatively, as depicted in the drawing, plain holes are made therein, and nuts 19 are fixed appropriately behind these holes. Thus, when the instrument 7 is in place and its casing is fixed by means of the screws 12 and the nuts 19, only the anterior part 20 of the surround 8 (the part situated forward of the posterior edges 14A of the regions 14) protrudes from the surface of the instrument panel.

Of course, other means of fixing the casing 6 into the recess 16 may be envisaged, for example clip-fastening means. As a preference, use is made of fasteners having a central imprint so as to restrict as far as possible

the diameter of the tool used for manipulation (for example: hexagon socket cap-head screws, cap-head screws with fixed internal lobes, cross-head screws, DZUS fasteners, etc).

Figure 5 depicts the anterior face of the instrument 7. The screen 2A of the cell 2, that is to say its useful surface, is surrounded with its crimping strip 2B, which is narrow (a few millimeters) in width, and by the frontal rim 8A of the surround 8, which is also narrow (a few millimeters) in width. By contrast, as depicted by hatching, the fixing device of the prior art comprises, in addition to the parts 2B and 8A, the parts 4C and 4D. The result of this is that by virtue of the invention, getting rid of the dead areas 4C, 4D appreciably reduces the total dead area around the screen 2A (by about 30%).